MCI Communications Corporation

1801 Pennsylvania Avenue, NW
Washington, DC 20006

June 29, 1998

Ms. Magalie Roman Salas
Secretary
Federal Communications Commission
1919 M Street, N.W. -- Room 222
Washington, DC 20554

Re: Ex Parte CC Docket No. 98-56/RM-9101 - Performance Measurements and Reporting Requirements for Operations Support Systems, Interconnection, and Operator Services and Directory Assistance

Dear Ms. Salas:

On Friday, June 26, Dr. James Miller, Cliff Dinwiddie, and I of MCI, and Jerome Epstein of Jenner & Block, met with Jake Jennings, Florence Setzer, Daniel Shiman, Bill Agee, Michael Pryor and Joe Welch to discuss MCI's views concerning statistical tests for parity with respect to performance measurements. The attached document was used as the basis of the discussion, and is being filed for inclusion in the record in the above referenced proceeding.

Two copies of this Notice are being submitted to the Secretary of the FCC in accordance with Section 1.1206(a)(1) of the Commission's Rules.

Sincerely,

Amy G. Zirkle

Amy G. Zirkle

Enclosure

cc: Jake Jennings
Florence Setzer
Daniel Shiman
Bill Agee
Michael Pryor
Joe Welch

Statistical Parity Tests

by

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MCI Telecommunications Corporation

June 26, 1998

General Principles

What is Parity?

Service provided by the ILEC on behalf of the CLEC is indistinguishable from service provided by the ILEC on behalf of its own affiliates and customers.

- Chance variation in measurements is expected, but any distinguishable difference in service quality puts the CLEC at a competitive disadvantage.
- There do not exist meaningful thresholds for "practical significance" of differences in performance quality. The Telecommunications Act of 1996 prevents discrimination without qualification.

Statistical Hypothesis Testing

- We wish to test
  - Ho (Null Hypothesis): ILECs provide parity in service for CLECs, vs.
  - Ha (Alternative Hypothesis): ILECs provide inferior service for CLECs
- Test is one-tailed
  - The Act and Commission regulations are properly concerned with identifying inferior service to the CLECs.
  - There is no incentive for ILECs to provide superior service, nor concern if they do.
- Reject Ho when the magnitude of observed difference is unlikely to occur by chance

Necessary Components

- Reasonable assumptions about measured data
- Test statistic whose distribution is known or can be approximated under Ho
- Critical value for making an accept/reject judgement about the parity hypothesis
- Controlled Type I error rate
- Optimal power for detecting types of departures from parity that prevents CLECs from competing on equal terms.
- Avoid unnecessary complexity.

The Local Competition User Groups
Z Tests

The Z-Test

- The z-test compares the difference between two like means, proportions, or rates on the scale of the standard normal distribution.
- The z value is the difference between the two means divided by an estimate of the "standard error" for the difference.
- The standard error of the difference is the likely size of chance variation in the difference calculation assuming the means come from distributions that are at parity

Test for Parity in Means

1. Calculate for each sample the number of measurements (n_{ILEC} and n_{CLEC}), the sample means ($\bar{x}_{ILEC}$ and $\bar{x}_{CLEC}$), and the sample standard deviations (σ_{ILEC} and σ_{CLEC}).

2. Calculate the difference between the two sample means; if *larger* CLEC mean indicates possible violation of parity, use $DIFF = \bar{x}_{CLEC} - \bar{x}_{ILEC}$, otherwise reverse the order of the CLEC mean and the ILEC mean.

3. To determine a suitable scale on which to measure this difference, we use an estimate of the population variance based on the ILEC sample, adjusted for the sized of the two samples: this gives the standard error of the difference between the means as

$$\sigma_{DIFF} = \sqrt{\sigma^2_{ILEC}\left[\frac{1}{n_{CLEC}} + \frac{1}{n_{ILEC}}\right]}$$

4. Compute the test statistic

$$z = \frac{DIFF}{\sigma_{DIFF}}$$

5. Determine a critical value c so that the type one error is suitably small.

6. Declare the means to be in violation of parity if $z > c$.

Test for Parity in Proportions

1. Calculate for each sample sample sizes (n_{ILEC} and n_{CLEC}), and the sample proportions (p_{ILEC} and p_{CLEC}).

2. Calculate the difference between the two sample means; if *larger* CLEC proportion indicates worse performance, use $DIFF = p_{\text{CLEC}} - p_{\text{ILEC}}$, otherwise reverse the order of the ILEC and CLEC proportions.

3. Calculate an estimate of the *standard error for the difference* in the two proportions according to the formula

$$\sigma_{\text{DIFF}} = \sqrt{p_{\text{ILEC}}(1 - p_{\text{ILEC}})\left[\frac{1}{n_{\text{CLEC}}} + \frac{1}{n_{\text{ILEC}}}\right]}$$

4. Hence compute the test statistic

$$z = \frac{DIFF}{\sigma_{\text{DIFF}}}$$

5. Determine a critical value c so that the type one error is suitably small.

6. Declare the means to be in violation of parity if $z > c$.

Test for Parity in Rates

1. Calculate the numerator and the denominator counts for both ILEC and CLEC, and hence the two rates $r_{ILEC} = num_{ILEC}/denom_{ILEC}$ and $r_{CLEC} = num_{CLEC}/denom_{CLEC}$.
2. Calculate the difference between the two sample rates; if *larger* CLEC rate indicates worse performance, use $DIFF = r_{CLEC} - r_{ILEC}$, otherwise take the negative of this.
3. Calculate an estimate of the *standard error for the difference* in the two rates according to the formula

$$\sigma_{DIFF} = \sqrt{r_{ILEC}\left[\frac{1}{denom_{CLEC}} + \frac{1}{denom_{ILEC}}\right]}$$

4. Compute the test statistic

$$z = \frac{DIFF}{\sigma_{DIFF}}$$

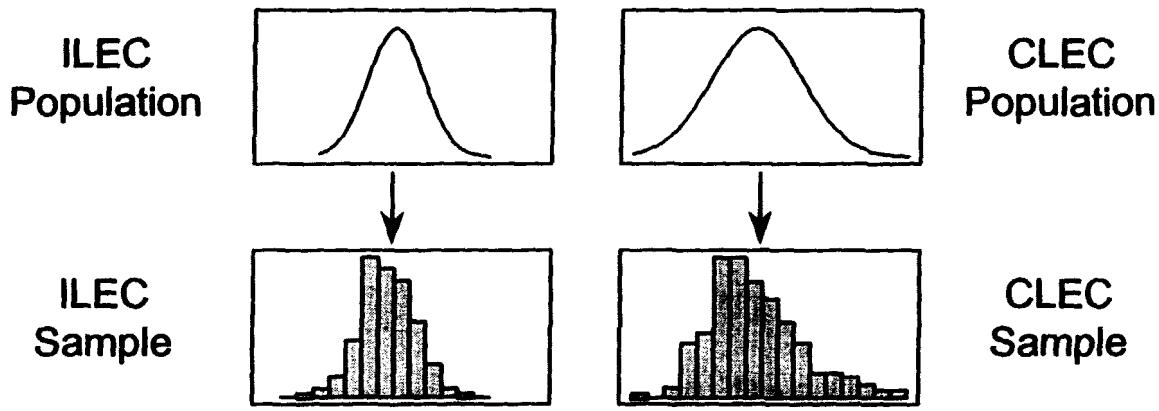
5. Determine a critical value c so that the type one error is suitably small.
6. Declare the means to be in violation of parity if $z > c$.

Models for Standard Error Calculations

- ILEC Variance - Appropriate calculation for determining parity to CLECs
  - Appropriate because in contexts of ILEC service to CLECs, to when it is reasonable to assume both samples should have roughly equal variance under Ho, but not necessarily under Ha
- Separate Variance - Not Appropriate in ILEC/CLEC Context
  - Appropriate when it is not reasonable to assume that both samples should have the same variances under either Ho or Ha
- Pooled Variance - Not Appropriate in ILEC/CLEC Context
  - Appropriate only when it is reasonable to assume both samples should have roughly equal variance under both Ho and Ha

Separate Variance

- Parity Assumption: The means come from distributions with the same mean, but not necessarily the same variance.



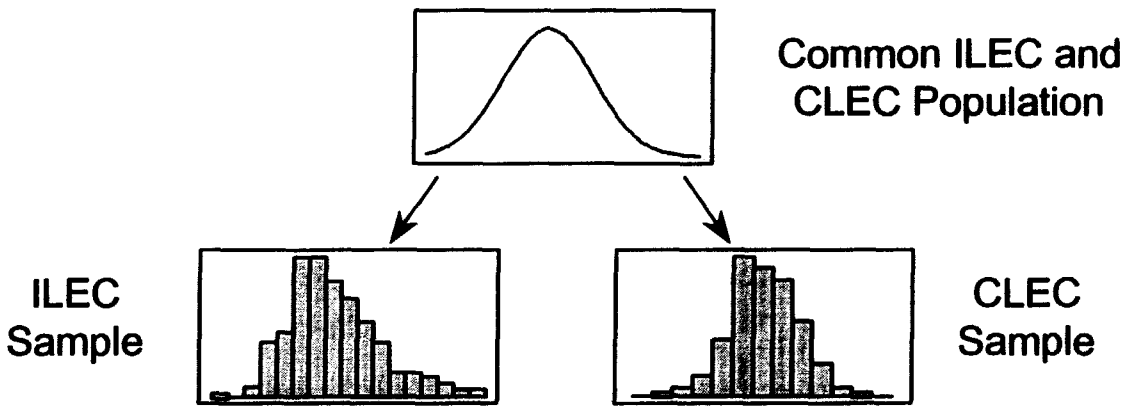
$$\sigma_{DIFF} = \sqrt{\frac{\sigma^2_{CLEC}}{n_{CLEC}} + \frac{\sigma^2_{ILEC}}{n_{ILEC}}}$$

Separate Variance: Comments

- There is no reason to allow for separate variances under the hypothesis of parity.
- This procedure will have poor power for detecting departures from parity when the CLEC variance is much larger than the ILEC variance: the large CLEC variance will inflate the standard error of the difference making differences in the mean appear less significant.

Pooled Variance

- Parity Assumption: The means come from distributions with the same mean and variance.
- Estimate standard error by pooling sample variances.



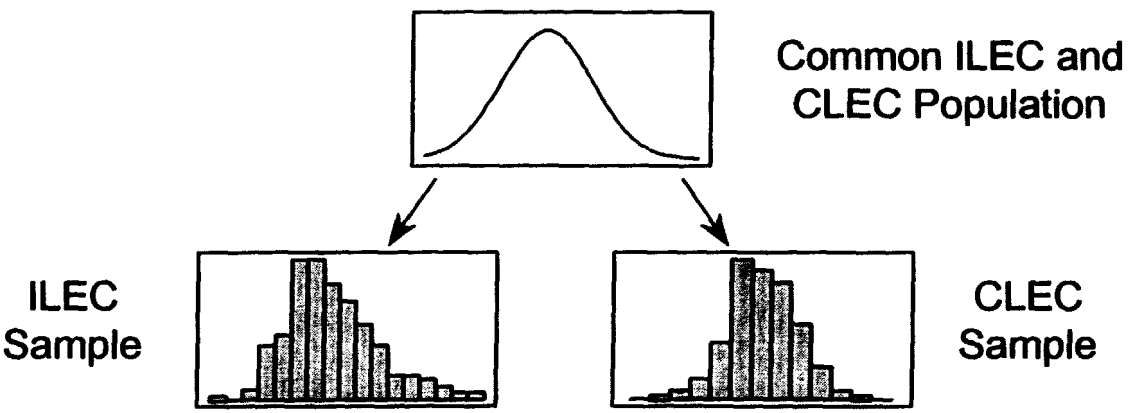
$$\sigma_{DIFF} = \sqrt{\frac{\sigma^2_{POOLED}}{n_{CLEC}} + \frac{\sigma^2_{POOLED}}{n_{ILEC}}} = \sqrt{\sigma^2_{POOLED}\left[\frac{1}{n_{CLEC}} + \frac{1}{n_{ILEC}}\right]}$$

Pooled Variance: Comments

- This procedure assumes that the ILEC and CLEC samples come from a common population when parity is being provided.
- Under Ha, population means may differ, but common variance is still assumed. Therefore, the ILEC and CLEC sample variances can be pooled to estimate the common population variance.
- If, under Ha, the CLEC variance is much larger than the ILEC variance, the standard error of the difference is inflated somewhat, but not to the degree exhibited by the separate variance formula.

ILEC Variance

- Parity Assumption: The means come from distributions with the same mean and variance.
- Estimate standard error using ILEC sample variance only.

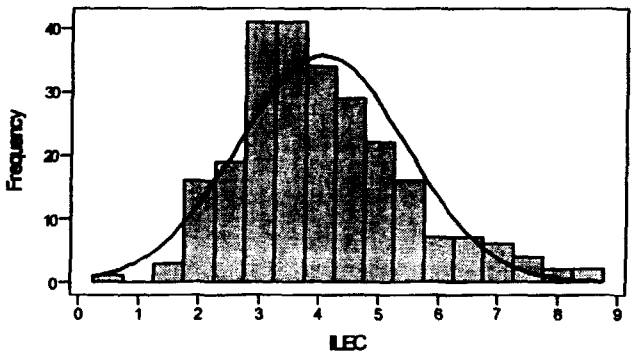


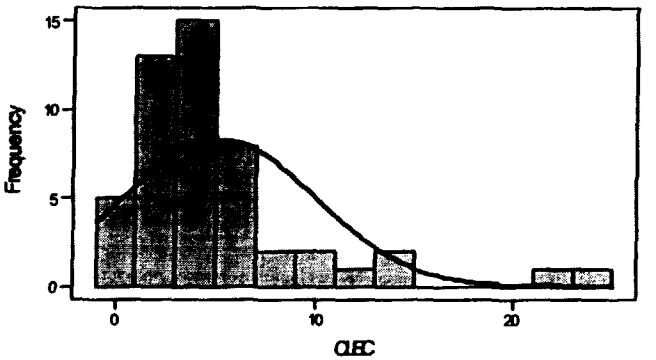
$$\sigma_{DIFF} = \sqrt{\sigma^2_{ILEC}\left[\frac{1}{n_{CLEC}} + \frac{1}{n_{ILEC}}\right]}$$

ILEC Variance: Comments

- This procedure assumes that the ILEC and CLEC samples come from a common population when parity is being provided.
- We anticipate that under Ha, the population variances may not be the same.
- If Ho is true, the ILEC variance alone is a reasonable estimate for the variance of both groups.
- If Ha is true, using the ILEC variance alone gives CLECs the greatest power to detect departures from parity that concern them most: those in which both the mean and variance of the CLEC population exceed that of the ILEC.

The CLEC Concern



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MTB > Describe  'ILEC' 'CLEC';
SUBC>  GNHist.
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Variable	N	Mean	Median	Tr Mean	StDev	SE Mean	Max	Q1	Q3
ILEC	250	4.0384	3.7964	3.9743	1.3981	0.0884	8.2707	3.0973	4.7950
CLEC	50	5.154	3.684	4.497	4.817	0.681	23.272	2.314	6.429